Amendments to the Specification

Please replace the paragraph beginning at page 10, line 31, with the following rewritten paragraph:

[49] Figure 1 illustrates an example of a time-of-flight mass spectrometer, set up to acquire primary spectra. ~~For the sake of clarity, the laser for the desorption and ionization of the samples has been omitted. A large number of samples are located on a carrier plate (1). The carrier plate is at a constant potential of 25 kilovolts, the acceleration voltage. A brief laser pulse of about three nanoseconds in length creates a cloud of ions, which spread towards a central electrode (2). The central electrode (2) is at first also at the acceleration voltage. After a delay following the laser pulse, the potential of the central electrode (2) is changed, so that the ions are accelerated. The potential of the central electrode (2) is not, however, constant – a time-shaped acceleration pulse is applied to it, which causes the time-focus created by the delayed acceleration to be placed at the ion detector (10), independently of the mass of the ions. Having passed the central electrode (2), the acceleration of the ions towards the grounded base electrode (3) is completed. The accelerated ions now fly with a mass-dependent velocity through the first flight path to the reflector, in whose deceleration field (8) they are initially sharply decelerated. In the homogenous reflector field (9) they are velocity-focused, since the faster ions (not shown in the figure) penetrate a little bit further, and therefore have a slightly longer flight path, so that they stay longer in the reflector and can catch up the slower ions, leaving the reflector somewhat earlier, precisely at the detector (10).~~

Please replace the paragraph beginning at page 11, line 12, with the following rewritten paragraph:

[50] Figure 2 shows the same time-of-flight mass spectrometer, but now it has been set up to acquire the daughter ion spectra from selected precursor ions. ~~The sample support plate (1) is now at a much lower potential, only about 5 kilovolts. Once again,~~

~~the laser pulse creates a cloud of ions, and these can spread freely into the space between the carrier plate (1) and the central electrode (2), because the central electrode (2) is initially at the same potential as the sample support plate (1). Here too, after a delay period, the potential of the central electrode (2) is changed. The effect of the delay period and the voltage is thus to place the time-focus for ions of one mass precisely in the precursor ion selector (4). The shape of the acceleration pulse ensures that this time-focus point is placed at the same location, independently of the mass. The potential on the precursor ion selector (4) initially deflects all the ions to one side, so that they can not reach the detector (10). As, however, the selected precursor ions (together with the daughter ions that have been created from them, and which fly with the same velocity) approach the selector, the deflection voltage is switched off. When the desired ions have passed through, the deflection voltage is re-applied in the opposite direction, so that as the ions fly away again, compensation is provided for deflections caused in the stray field as the ions approached. The precursor ions and their daughter ions now enter the potential lift (5). When they have entered, the potential of the lift (5) and of the central electrode (6) is raised by 20 kilovolts. The ions now pass the potential lift (5), and enter the space between the lift (5) and central electrode (6). A acceleration pulse is now applied to the central electrode (6), initiating the acceleration and resulting in time-focusing at the detector (10). The further acceleration takes place between the central electrode (6) and the base electrode (7). Shaping of the acceleration pulse makes the location of this time-focus independent of the mass. The reflector is now used as a daughter ion analyzer, because, in comparison with their precursors, the daughter ions have somewhat less energy, even not in full proportion to their lower mass because of the post-acceleration. This causes all the daughter ions, from the smallest mass up to the mass of the precursor ions, being reflected in the reflector so that they can be acquired in one spectrum.~~

Please replace the paragraph beginning at page 12, line 21, with the following rewritten paragraphs:

[55] In Figure 1, a large number of samples are located on a carrier plate (1). The carrier plate is at a constant potential of 25 kilovolts, the acceleration voltage. From laser (11), a brief laser pulse of about three nanoseconds in length creates a cloud of ions, which spread towards a central electrode (2). The central electrode (2) is at first also at the acceleration voltage. After a delay following the laser pulse, the potential of the central electrode (2) is changed, so that the ions are accelerated. The potential of the central electrode (2) is not, however, constant - a time-shaped acceleration pulse is applied to it, generated by pulse generator 15. The acceleration pulse causes the time-focus created by the delayed acceleration to be placed at the ion detector (10), independently of the mass of the ions. Having passed the central electrode (2), the acceleration of the ions towards the grounded base electrode (3) is completed. The accelerated ions now fly with a mass-dependent velocity through the first flight path to the reflector, in whose deceleration field (8) they are initially sharply decelerated. In the homogenous reflector field (9) they are velocity-focused, since the faster ions (not shown in the figure) penetrate a little bit further, and therefore have a slightly longer flight path, so that they stay longer in the reflector and can catch up the slower ions, leaving the reflector somewhat earlier, precisely at the detector (10).

[55.1] ~~To this end~~ As mentioned above, a delayed, time-shaped acceleration pulse is applied to the first acceleration section of the ion source between the sample support plate (1) and the central electrode (2). The pulse is generated by pulse generator 15, which receives a signal from clock 16 when switch 17 is in the appropriate position. The pulse shape is chosen in such a way that an even, high resolution in the ion signal with good mass resolution is obtained across the whole spectrum, from the light to the heavy ion masses. The ions are generally accelerated here by a voltage between 20 and 30 kilovolts. The even resolution allows all the ion masses in the spectrum to be accurately determined from their flight time.

[55.2] Figure 2 shows the same arrangement as Figure 1, but in a configuration that allows the acquisition of daughter ion spectra from selected precursor ions. The

sample support plate (1) is now at a much lower potential, only about 5 kilovolts. Once again, the laser pulse creates a cloud of ions, and these can spread freely into the space between the carrier plate (1) and the central electrode (2), because the central electrode (2) is initially at the same potential as the sample support plate (1). Here too, after a delay period, the potential of the central electrode (2) is changed. The effect of the delay period and the voltage is thus to place the time-focus for ions of one mass precisely in the precursor ion selector (4). The shape of the acceleration pulse ensures that this time-focus point is placed at the same location, independently of the mass. The potential on the precursor ion selector (4) initially deflects all the ions to one side, so that they can not reach the detector (10). As, however, the selected precursor ions (together with the daughter ions that have been created from them, and which fly with the same velocity) approach the selector, the deflection voltage is switched off. When the desired ions have passed through, the deflection voltage is re-applied in the opposite direction, so that as the ions fly away again, compensation is provided for deflections caused in the stray field as the ions approached. The precursor ions and their daughter ions now enter the potential lift (5). When they have entered, the potential of the lift (5) and of the central electrode (6) is raised by 20 kilovolts. The ions now pass the potential lift (5), and enter the space between the lift (5) and central electrode (6). A acceleration pulse is now applied to the central electrode (6), initiating the acceleration and resulting in time-focusing at the detector (10). The further acceleration takes place between the central electrode (6) and the base electrode (7). Shaping of the acceleration pulse makes the location of this time-focus independent of the mass. The reflector is now used as a daughter ion analyzer, because, in comparison with their precursors, the daughter ions have somewhat less energy, even not in full proportion to their lower mass because of the post-acceleration. This causes all the daughter ions, from the smallest mass up to the mass of the precursor ions, being reflected in the reflector so that they can be acquired in one spectrum.

Please replace the paragraph beginning at page 12, line 27, with the following rewritten paragraph:

[56] It has been found that for shaping the pulse for the accelerating field, an exponential function that approaches a limit value is highly effective. This exponential modification of the voltage between the sample support plate (1) and the central electrode (2) obeys the following function:

$$U_1 = V_1 \times \{1 - \exp(-t/t_1)\}$$

where the acceleration voltage U_1 begins at time $t = 0$ and approaches the limit value V_1 with a time constant t_1. This kind of exponential function can easily be generated with an electrical capacitor circuit (such as an R-C network, which might be part of the pulse generator 15 in the embodiments of Figure 1 and Figure 2), without the need for further complicated control. The optimum delay time, the optimum limit potential V_1 and the optimum time constant t_1 are determined experimentally.

Please replace the paragraph beginning at page 13, line 25, with the following rewritten paragraph:

[60] Meanwhile the summed spectrum, whose ion signals represent the flight times and intensities of the different types of ions, is processed into a list of ion masses and ion intensities by means of a calibration curve. The mass list is passed to an expert program (part of detector electronics 18) that attempts to identify the protein by searching spectral databases or protein sequence databases. If an unambiguous identification is not possible, or if there are any other uncertainties, caused for instance by a peptide that does not correspond to the expected mass, then the acquisition of daughter ion spectra for one or more peptides in this sample is earmarked. The expert program specifies those peptides from which daughter ion spectra are to be acquired.